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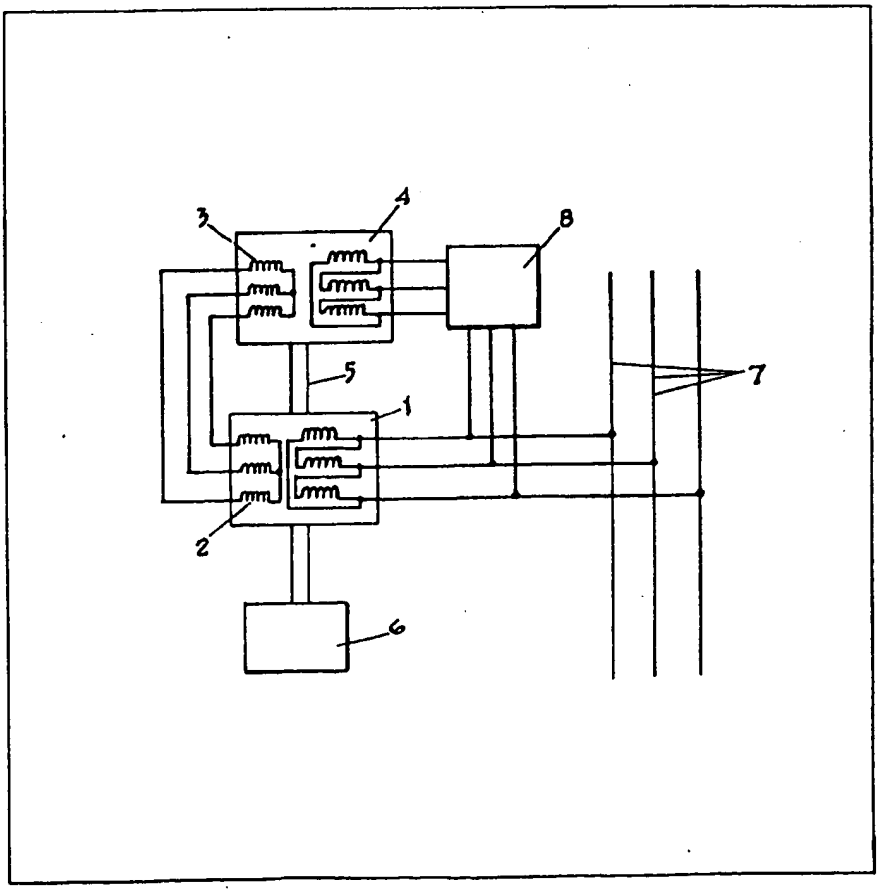
(54) Alternating current generating equipment

(57) An alternating current power generating system incorporates a generator (1) in the form of a dynamo-electric machine having stator and rotor windings wound as for a wound rotor induction motor, and an exciter (4) in the form of an induction motor having its rotor coupled to that of the generator with the rotor windings (3, 2) of both machines interconnected, the stator winding of the generator being connected to conductors (7) of a three-phase supply of substantially constant frequency, and the stator winding of the exciter being connected to control means (8) for feeding the winding with alternating current of controlled voltage and frequency. By suitably controlling the frequency supplied to the exciter the output frequency from the generator (1) can be maintained substantially constant and equal to that of the supply, provided the speed of the generator rotor is above a certain value. The system may be powered by a turbine 6 driven by wind, wave or tide power.



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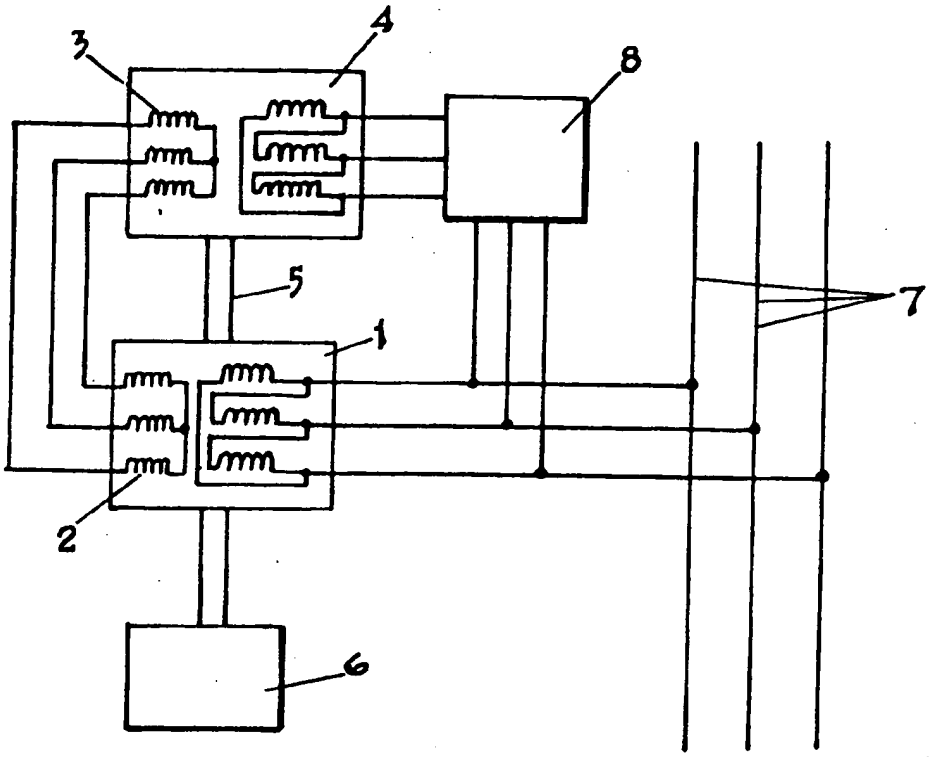

SPECIFICATION

Power generating equipment

This invention relates to electrical power generating equipment.

On some types of power generating equipment the rotational speed of an alternating current generator may vary widely and in a random manner. Such applications include the harnessing of wave, wind and tidal power. In order to feed this power into the National Grid or to parallel a number of generators onto a common bus, the random frequency outputs from these generators must be converted into a common standard, that is 50 H_z in this country.

With present day technology the first approach would be to use a static method of conversion (rectifying and inverting) but this still has certain limitations regarding maximum available rating, cost reliability and control complexity.

According to the invention an alternating current electrical power generating system comprises a generator in the form of a dynamo-electric machine having stator and rotor windings wound as for a wound rotor induction motor, means for driving the rotor of the generator, an exciter in the form of an induction motor having its rotor rotatable with the generator rotor, for example by being mounted on the same shaft, with the rotor windings of the exciter and generator interconnected, the stator winding of the generator being connected to conductors of a three-phase supply of substantially constant frequency, and the stator winding of the exciter being connected to control means for feeding the winding with alternating current of controlled voltage and frequency.

This arrangement can be regarded as consisting of an AC generator whose control field is also excited by AC in place of the more conventional DC, and by suitable control of the frequency supplied to the exciter the output frequency from the generator can be maintained substantially constant and equal to that of the supply, as long as the speed of rotation of the generator is above a certain value.

Switching means can be provided for automatically cutting-off the generator from the constant frequency supply if its speed of rotation falls below said value in order to prevent power being taken from the supply in those circumstances.

The invention will be further explained by describing by way of example, with reference to the accompanying schematic drawing, one form of alternating current generating arrangement in accordance with the invention.

The arrangement comprises a main generator 1 in the form of a wound rotor induction motor having its rotor winding 2 connected to rotor winding 3 of an exciter 4 in the form of another induction motor, the rotors of both machines being mounted on a common shaft 5. The rotor shaft is also coupled to driving means whose rotational speed may fluctuate in use.

The exciter 4 is fed from bus-bars 7 of a three phase constant frequency supply, and is phase and frequency controlled by a controller 8 to ensure a frequency of current in the rotor link of $F_s \pm NP$ where

F_s = frequency of the supply
N = speed of the generator and exciter rotors
P = number of poles of the generator and of the exciter.

With such an arrangement, provided the speed of rotation of the generator is more than a predetermined value, power will be fed into the bus-bars 6 from the generator at the supply frequency, even though the generator speed varies.

Accordingly the invention is particularly suitable for use in systems where the means 6 for driving the generator operates at varying speeds, for example in the case of a turbine driven by wave, wind or tidal power. However the invention is also applicable to arrangements utilising other forms of drive means liable to speed fluctuations.

It will be observed that since the rotor windings of the generator and exciter are interconnected the system avoids the use of slip rings.

CLAIMS

1. An alternating current power generating system comprising a generator in the form of a dynamo-electric machine having stator and rotor windings wound as for a wound rotor induction motor, means for driving the rotor of the generator, an exciter in the form of an induction motor having its rotor rotatable with the generator rotor, with the rotor windings of the exciter and generator interconnected, the stator winding of the generator being connected to conductors of a three-phase supply of substantially constant frequency, and the stator winding of the exciter being connected to control means for feeding the winding with alternating current of controlled voltage and frequency.

2. An alternating current power generating system according to Claim 1 including switching means for cutting off the generator from the constant frequency supply if its speed of rotation falls below a predetermined value.

3. An alternating current power generating system wherein the generator rotor is coupled to a turbine or other rotary device driven by wave, wind or tidal power.

4. An alternating current power generating system substantially as shown in and as hereinbefore described with reference to the accompanying drawing.

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